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Mahmadajaruddin G
Department of Agricultural Economics, College of Agriculture, Dharwad University of Agricultural Sciences, Dharwad, Karnataka, India

Avinash Mamani
Department of Agricultural Economics, College of Agriculture, Dharwad University of Agricultural Sciences, Dharwad, Karnataka, India

Corresponding Author:
Mahmadajaruddin G
Department of Agricultural Economics, College of Agriculture, Dharwad University of Agricultural Sciences, Dharwad, Karnataka, India

Growth and export performance of Onion in India: An economic analysis

Mahmadajaruddin G and Avinash Mamani

Abstract
The present study is conducted in a view to study the growth performance of onion in India. For this the secondary data on area, production and productivity of onion in major onion growing states of India and export of onion from India over the years were collected. The growth rate technique and instability index were employed to analyze. The data collected from 2006-07 to 2017-18. The results revealed that Gujarat recorded negative and significant growth rates of -6.11, -6.28 and -0.18 per cent per annum in area, production and productivity of onion respectively. Rajasthan exhibited high variability in area (43.30), production (46.70) and productivity (36.76). Quantity of onion production in India exhibited a positive growth rate of 6.34 per cent per annum and was statistically non-significant at five per cent level of significance. Quantity of onion production in India has shown variability of (24.33%), Quantity of onion exports registered a growth rate of 3.14 per cent per annum and in terms of value 9.09 per cent per annum which is non-significant. With reference to the variability of onion exports, the value of onion exports exhibited a highest variability (35.01 per cent) than that of quantity (25.22 per cent). The positive growth rate in quantity of onion production attributed to increase in area under the onion cultivation coupled with use of improved cultivars and with increase in demand for India's onions in the international market. The variability in exports and value of exports is due to high fluctuations in the domestic prices whenever the scarcity is felt.

Keywords: Onion area, onion production, onion productivity, onion exports

Introduction
Onion (*Allium cepa* L.) is one of the important condiments widely used in all households all the year round. It is commonly known as "Queen of the kitchen" due to its highly valued flavor, aroma, and unique taste, and the medicinal properties of its flavor compounds. Onion is an important commercial crop which is cultivated across 178 countries of the world (World Atlas, 2018). It is widely cultivated second only to tomato, and this crop is known to most cultures and consumed worldwide (FAO, 2012). The total onion production in the World in 2017 was 97.86 million tonnes, which was harvested in the area of 52.01 lakh ha, and the average yield was about 18.82 MT/ha, out of which China is the leading country with production of 24.34 million tonnes (24.87% of total world production) in an area of 11.02 lakh ha, with a productivity of 22.1 MT/ha, followed by India (22.42 million tonnes), USA (3.72 million tonnes) and Iran (2.37 million tonnes).
During 2017-18, Maharashtra was first in the country's Onion production of 8854.09 thousand tonnes with an area of 507.96 thousand hectares and productivity of 17.43 MT/ ha. This state solely contributes for about 39.5 per cent of the total area under onion cultivation and 38.1 per cent to the country's total onion production. Madhya Pradesh is the second largest in terms of production (15.9%), followed by Karnataka (12.8%) and Bihar (5.3%). There is a lot of demand for Indian Onions in the world; the country has exported 21.8 lakh tonnes of fresh Onions worth of Rs. 3468.83 crores during 2018-19, among which (26.5%) of total onion exported to Bangladesh fallowed by Malaysia (15.2%), UAE (11.8%) Sri Lanka (10.3%).
Objectives
1. To study the trends in Onion area, production and productivity in major states of India;
2. To study the growth pattern and instability of Onion production and exports in India;

Methodology
The secondary data on area, production and productivity of Onion in major onion growing states like Maharashtra, Karnataka, Gujarat, Bihar, Rajasthan, Haryana, Others and India. Both quantity and value of onion exports from India (2006-07 to 2017-18) were collected by referring the sources from *www.indiastat.com* and other published literature to study the growth performance of onion in India. Further, the data had been analyzed by employing the below mentioned analytical tools.

An exponential function of the following type was fitted to estimate the growth rates. The details of equation and its parameters are depicted as under.

$$Y = ab^t$$

The above equation was converted into the following log linear form for applying ordinary least square (OLS)

$$\ln (Y) = \ln (a) + t \ln (b)$$

Denoting ln (a) as 'A' and ln (b) as 'B', the above equation can be further expressed as

$$Ln (Y) = A + Bt$$

The compound growth rate in Y (area, production, productivity, quantity, value and exports of Onion) is calculated as

$$[Antilog (B) -1] X 100$$

The collected data was also analyzed by coefficient of variation as a measure of instability and calculated as under

$$CV (\%) = \frac{\text{Standard Deviation } (\sigma)}{\text{Mean } (X)} X100$$

$$SD = \sqrt{1/n \Sigma (x - x) 2}$$

Σ xi = Sum of observations
n = Number of observations

Results and Discussion

Growth rates of area, production and productivity of onion

The results of Table-1 revealed that The growth rate for area was statistically significant at five per cent level of significance in Karnataka, Gujarat and Rajasthan excluding Maharashtra, Bihar, Haryana, Others and India which are non-significant. Among the states, Maharashtra recorded a highest and positive growth rate (8.80 per cent per annum) followed by Haryana (6.34 per cent per annum) and Rajasthan (5.53 per cent per annum). Gujarat recorded negative growth rate of (-6.11 per cent per annum), others were also exhibited a positive growth rate (6.76 per cent per annum) but non-significant. And India as a whole registered a positive and non-significant growth of 5.60 per cent at five per cent level of probability. The calculated growth rate of onion production was found to be significant at five per cent in Karnataka (0.89) and Gujarat (-6.28). Maharashtra, Bihar, Rajasthan, Haryana and others were exhibited a positive but non-significant growth rates of 8.06, 2.92, 12.11, 8.84, 10.87 and 6.34 per cent per annum respectively. The growth rate of productivity of onion was found to be positive and significant for Rajasthan (6.23 per cent per annum) and India (0.69 per cent per annum). Positive and non-significant growth rates were registered in case of Bihar (2.43 per cent per annum), Haryana (2.34 per cent per annum) and others (3.85 per cent per annum). Maharashtra, Karnataka and Gujarat recorded negative growth rates of -0.68, -1.62 and -0.18 per cent per annum respectively and were found non-significant. With respect to India the increase in production of onion during the study period attributed due to positive correlation between area and production (0.96). Instability was much observed in case of production and it is due to area instability, this result supports the findings of Patil and Kerur and (2016) [4]. From the results of their research study, it was reported that 6.71 per cent per annum of growth rate was observed in the area under onion cultivation over 20 years (1995-2015). In case of production it was 10.12 per cent growth rate and yield was about 2.23 per cent per annum.

Variability in area, production and productivity of onion

It is shown from the table that coefficient of variation for area was found to be highest in case of Rajasthan (43.30 per cent) followed by Gujarat (32.40 per cent), Maharashtra (32.34 per cent), others (23.77 per cent), Haryana (23.06 per cent), Karnataka (14.16 per cent), Bihar (2.40 per cent) and India as a whole (20.16 per cent). Production Instability was found highest in Rajasthan (46.70 per cent) followed by Gujarat (34.55 per cent), Haryana (30.16 per cent), Maharashtra (29.96per cent), others (23.87 per cent), Karnataka (21.87 per cent), Bihar (11.79 per cent) and India (23.70 per cent). With respect to the instability of productivity, Rajasthan is highest with (36.73 per cent) followed by Karnataka (18.74 per cent), Maharashtra (14.09 per cent), Bihar (9.81 per cent), others (9.80 per cent), Haryana (8.64 per cent), Gujarat (2.98) and India (6.86 per cent). Instability in productivity was mainly due to the shifting of farmers towards high yielding varieties of onion. Since the crop is one among the irrigated crop and volatility in the market price results in area instability this result supports the findings of Patil and Kerur and (2016) [4]. For area it was observed 40.93 per cent of variation, production 59.04 per cent variation and 19.79 per cent variation for productivity. It was observed in instability index, with respect to India variation was much observed in case of production which is mainly due to farmers changing the onion varieties.

Compound growth rates and instability of onion exports

It showed that the quantity of onion exports from India exhibited a positive and significant with growth rate of 3.14 per cent per annum at five per cent level of significance and value of onion exports recorded 9.09 per cent growth rate per annum but non-significant at five per cent level of significance. With reference to the variability of onion exports, the value of onion exports exhibited a highest variability (35.01 per cent) than that of quantity (25.22 per cent). The positive growth in value and quantity is due to consistent export till any shortage in domestic market is felt.

Table 1: State wise growth and instability of onion area, production and productivity in India (2006-07 to 2017-18)

Description States/India	Compound growth rate (per cent per annum)			Coefficient of variation (%)		
	Area (in '000 ha)	Production (in '000 tonnes)	Productivity (in tonnes/ha)	Area (in '000 ha)	Production (in '000 tonnes)	Productivity (in tonnes/ha)
Maharashtra	8.80^{NS} (368.76)	8.06 ^{NS} (5286.68)	-0.68* (14.67)	32.34	29.96	14.09
Karnataka	2.56* (172.52)	0.89* (2569.49)	-1.62* (14.90)	14.16	21.87	18.74
Gujarat	-6.11* (52.83)	-6.28* (1326.62)	-0.18* (24.97)	32.40	34.55	2.98

Bihar	0.47* (53.08)	2.92 NS (1134.65)	2.43 NS (21.34)	2.40	11.79	9.81
Rajasthan	5.53* (63.67)	12.11 NS (731.09)	6.23* (12.09)	43.30	46.70	36.73
Haryana	6.34 NS (24.94)	8.84 NS (532.55)	2.34 NS (20.99)	23.06	30.16	8.64
Others	6.76 NS (319.98)	10.87 NS (5490.84)	3.85 NS (53.64)	23.77	23.87	9.80
India	5.60 NS (1055.75)	6.34 NS (17071.91)	0.69* (16.09)	20.16	23.70	6.86

Note: Figures in parentheses are mean values
* Significant at 1 per cent
NS- Non-Significant

Table 2: Growth rates and instability analysis of quantity and value of onion exports from India (2006-07 to 2017-18)

YEAR	Production	Onion Exports (000' MT)	Value (Rs. in crores)
2006-07	10847.4	1378373.17	1163.31
2007-08	13900.4	1008606.48	1035.78
2008-09	13564.5	1670186.29	1827.52
2009-10	12158.8	1664922.39	2319.43
2010-11	15117.7	1182324.20	1779.29
2011-12	17511.1	1309924.82	1723.00
2012-13	16813	1666872.60	1966.63
2013-14	19401.7	1482498.58	3169.61
2014-15	18927.4	1238102.60	2300.54
2015-16	20931	1382959.54	3097.21
2016-17	22427	2415739.06	3106.06
2017-18	23262	1588985.72	3088.82
2018-19	23610	2183766.42	3468.87
Mean	17574.76	1551789.37	2311.23
CAGR (per cent per annum)	6.34 NS	3.14*	9.09 NS
CV (%)	23.70	25.22	35.01

* Significant at 1 per cent
Note: NS- Non-Significant
Source: http://www.indiastat.com

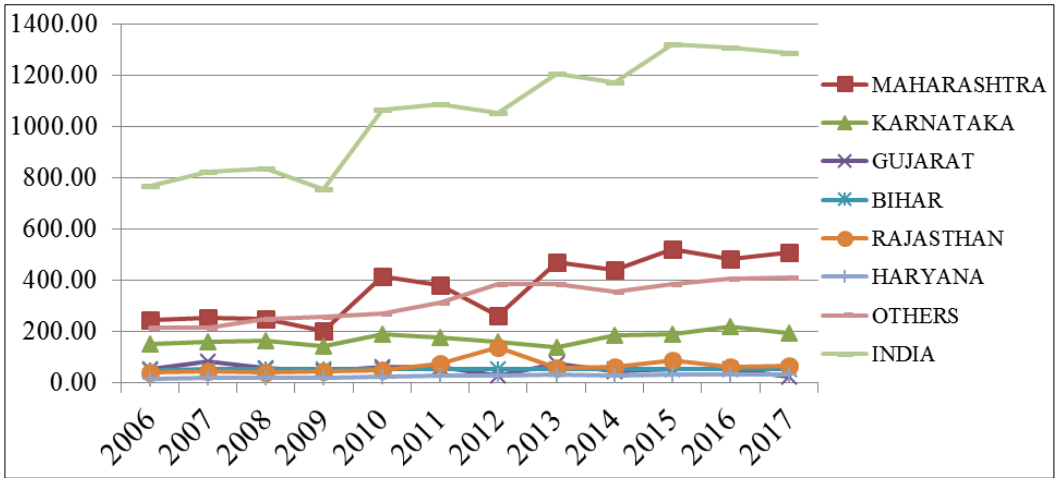

Fig 1.1: Area under Onion cultivation in major Onion growing states (2006-07 to 2017-18)

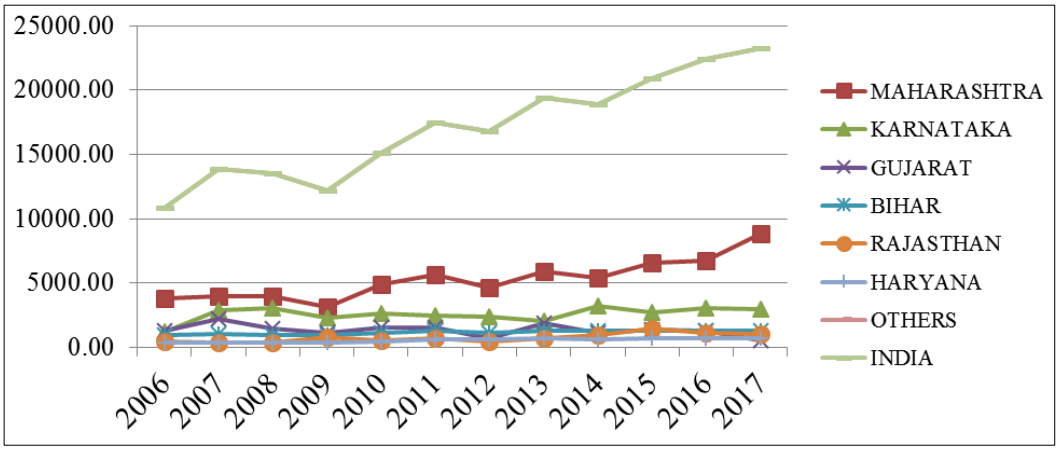

Fig 1.2: Production of Onion in major Onion growing states (2006-07 to 2017-18)

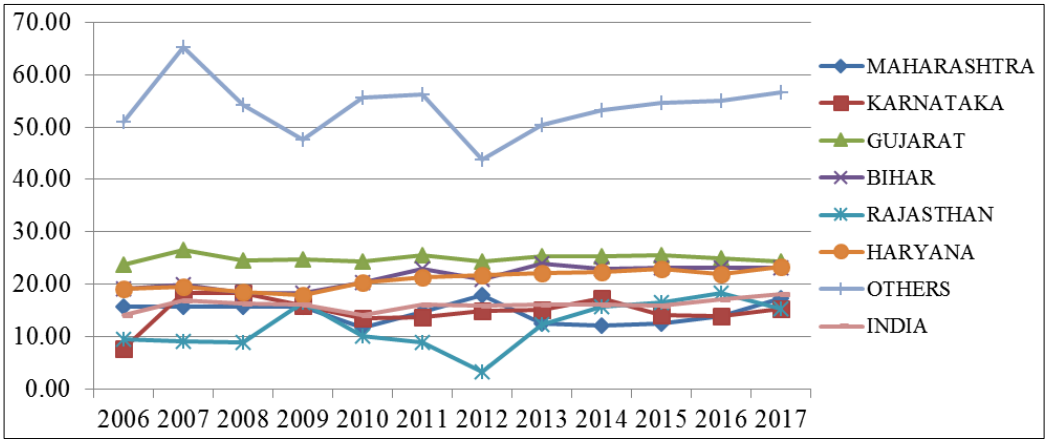

Fig 1.3: Productivity of Onion in major Onion growing states (2006-07 to 2017-18)

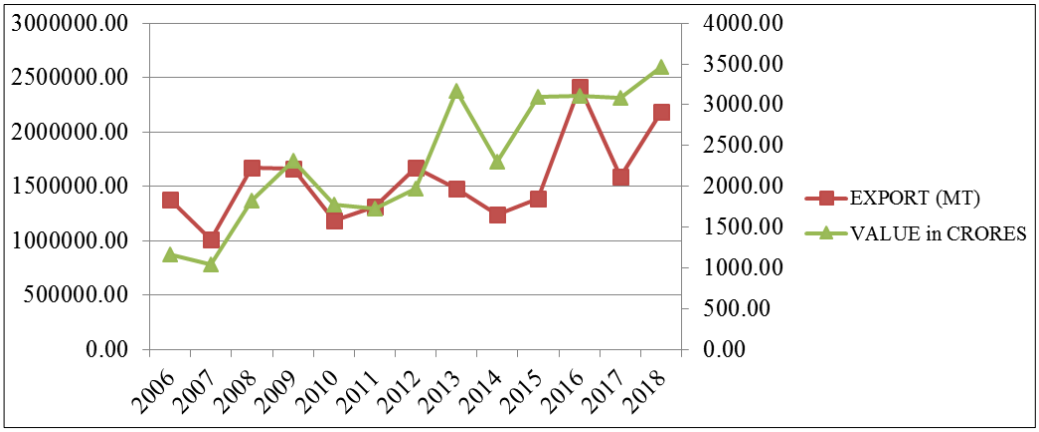

Fig 2: Quantity of Onion exports from India and its value (2006-07 to 2018-19)

Conclusion

A majority of the states showed a positive and non-significant growth rates in area, production and productivity of onion, except Gujarat. This was due to unseasonal weather conditions and frequent onion crisis occurred in 2010, 2013 and 2015 which lead to shift in crop. The variability was mainly attributed to fluctuation in area and production of onion during the study period. The positive growth rate in quantity of onion production attributed to increase in area under the onion cultivation coupled with use of improved varities. And Increase in value may be due to increase in demand for onion. Hence the Government intervention is also necessary to safeguard the interest of farmers to enhance production volume and the exports. Production planning through geographical expansion, adjusting the seasons and promotion of processing industry.

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